AN APPARATUS AND METHOD FOR DETECTING RADIATION THAT USES A STIMULABLE PHOSPHOR

ABSTRACT OF THE DISCLOSURE

Radiation doses ranging from a very weak level to a very high instantaneous level can be monitored real-time by a differential and integral type of radiation measuring apparatus in a convenient and precise manner using a stimulable phosphor as a radiation detecting medium. The radiation detecting portion comprises in planar superposition a bundle of laterally radiating optical fibers, a stimulable phosphor, an optical filter centered at the wavelength of fluorescence, and a bundle of wavelength shifting optical fibers sensitive to the wavelength of stimulated fluorescence. On the basis of two actions of the stimulable phosphor, one for emitting stimulated fluorescence in proportion to the dose of incident radiation upon illumination with exciting light and the other for emitting prompt fluorescence upon excitation by the incident radiation, the radiation detecting portion selectively detects stimulated fluorescence and prompt fluorescence at specified time intervals. A saturation check circuit monitors the fluorescence detecting mechanism at specified time intervals to see if it is saturated by high-intensity radiation and after it is recovered from saturation, the dose of rapid intense radiation is read with the quantity of exciting light on the stimulable phosphor being altered to ensure radiation measurement without saturation of the fluorescence detecting mechanism.

To read the dose of radiation, the stimulable phosphor is illuminated with pulsed exciting light having a short time duration and the emission of stimulated fluorescence is detected with a photodetector, amplified with a charge-sensitive preamplifier, waveform shaped with a pulse shaping amplifier and passed through an analog/digital converter to provide pulse height data, which is processed by a data collecting and processing circuit to determine the dose of radiation accumulated in the stimulable phosphor.